Final Report

ASSESSING THE IMPACT OF CHANGES IN TECHNOLOGY ON MEDICARE EXPENDITURES FOR PHYSICIAN SERVICES: BACKGROUND, ISSUES, AND OPTIONS

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16. Abstract (Limit: 200 words)

The report addresses the following areas: (a) conceptual and terminological issues, (b) approaches used in the economics and health services literature to analyze the impact of technological change on health expenditures, and (c) major alternative approaches for assessing the impact of technological change on Medicare expenditures for physician services.

Two general methods for measuring the impact of technology on costs were identified from the literature review and are discussed in the final report. These include: (a) the residual approach and (b) the technology-specific approach. The residual approach analyzes the relationship between technology and expenditures at an aggregate level, attempting to account for the growth in costs by measurable factors, such as price inflation and the growth and aging of the population. The unexplained residual is attributed in large part to changes in technology. The technology-specific approach attempts to analyze changes in the use of specific technologies and therapies over time, and to aggregate their impact.

The paper suggests that MVPS refinements based on technology changes are not desirable because of: (a) difficulties in measuring costs implications of emerging technologies, and (b) the appropriateness of using a global type reimbursement control mechanism (MVPS) to affect technology-specific diffusion.

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ABSTRACT

The purpose of this report is to identify, describe, and assess potential alternative approaches to considering the impact of changes in medical technology on Medicare expenditures for physician services. A discussion of the definition of technology and technological change alone suggests some of the difficulties that empirical studies on the topic face. The relevant literatures in health economics and health services research are summarized. Previous studies have generally either estimated aggregate technological change as the residual of unexplained change or have attempted to analyze the cost impact of specific technologies and then generalize to the whole. The possibility of using these approaches to assist in developing the Medicare Volume Performance Standards is considered, but it is argued that none of these approaches is suitable for this purpose. Indeed, given the year-to-year variability in the estimated residual component, assessing actual performance relative to such a standard could be seriously misleading. Given the biases in our system toward the adoption of cost-increasing technological changes, establishing an annual aggregate allowance through the MVPS for such changes will not promote their appropriate diffusion, and runs the risk of simply perpetuating such changes on an undifferentiated, pass-through basis.

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1. INTRODUCTION

Since 1980, growth in the expenditures for physician services has continued to outstrip increases in general inflation and in population. This is true both for services used by the Medicare population and by the general population (Office of National Cost Estimates, 1990; Kay, 1990). In response to these cost increases and other perceived inequities and imbalances in the current physician reimbursement system, in the Omnibus Budget Reconciliation Act of 1989 (OBRA89; P.L. 101-239), Congress initiated a reform of Medicare's system for paying physicians. Beginning in January 1992, Medicare reimbursement levels will be based on a new Medicare Fee Schedule, with relative payment amounts based on estimates of the relative resource costs of providing services.

In addition to basing relative fees on relative resource costs, another important feature of this reform is the method by which the level of fees is increased over time through adjustments to a "conversion factor", which when multiplied by relative values establishes payment levels (subject to some geographic adjustments). Recommended annual changes in this conversion factor are to depend on a comparison of actual aggregate expenditure growth with a "growth standard". This standard (or set of standards) is called the Medicare Volume Performance Standard (MVPS) rate of increase. The conversion factor for the fee schedule will be updated based on how actual expenditure increases compare to the previously determined performance standard. By April 15 of each year, the Secretary of Health and Human Services must recommend to Congress proposed MVPS rates of increase for the next fiscal year. The legislation specifically requires that this recommendation consider several factors, including inflation, changes in the number and age of enrollees, changes in technology, impacts on access to care and inappropriate use, as well as other factors.

As these legislative requirements suggest, in undertaking any reform to contain costs, questions arise about impacts on access to care and the volume of services received by beneficiaries. Although this reform is intended to encourage some redistribution of services from subspecialty to primary care, for example, there is also concern that there will be unintended impacts that affect access to care for particular populations or for particular procedures or types of treatment. In response to these concerns, the instructions of Congress to HHS on the setting of the MVPSs explicitly call for a consideration of evidence of lack of access to care, the inappropriate use of services, and technological change.

The purpose of this report is to identify, review, and assess alternative approaches for considering how changes in technology affect Medicare physician expenditures. A companion report has been prepared regarding impacts on access to care and inappropriate use.

Section 2 discusses some conceptual and terminological issues involved in defining technology, technological change, and various types of changes. Section 3 reviews the approaches used in the economics and health services literatures to analyze the impact of technological change on expenditures. Section 4 outlines the major alternative approaches, and their pros and cons, for assessing the impact of technological change on Medicare expenditures for physician services. Section 5 concludes with some general observations on the relationship of this issue to other HHS initiatives on practice guidelines and coverage policy.

2. DEFINING TECHNOLOGY AND TECHNOLOGICAL CHANGE

What is technology and how is it measured? The answers to these simple questions are not as straightforward as many might imagine. Consideration of the definition of medical technology used by Congress's Office of Technology Assessment (1982) provides a good starting point:

> "Drugs, devices, and medical and surgical procedures used in medical care, and the organizational and supportive systems within which such care is provided."

Obviously, when most people think of new technologies, they think of new drugs, such as the thrombolytic agents used to break up the blood clots causing a heart attack, or new devices, such as magnetic resonance imaging, or new procedures, such as organ transplantation. There is much less appreciation of the more subtle organizational and support structure changes suggested by the latter portion of the definition. One can characterize the former types of changes as "hard", identifiable technological changes and the latter as "soft", more subtle changes.

Economics also provides a framework for thinking about technology and technological change that has some similarities to this approach. A distinction is made in economics between <u>product</u> and <u>process</u> innovations. The former group is defined as the making of new <u>things</u> (using old tools) and the latter as new <u>ways</u> of making old things. This corresponds roughly to the distinction between hard and soft changes, though the analogy is not perfect. For example, sometimes a product innovation becomes part of a process innovation, such as the extension of lithotripters to pulverize gallstones in addition to kidney stones. Also, new surgical procedures, such as laparoscopic cholecystectomy, are more process, than product, innovations, though they may be perceived by many as "hard", identifiable changes.

"Technology" is an elusive concept even in economics. Economics does not really have a clear definition of technology, say, as it does for demand, supply, opportunity cost, etc. Economists loosely use the term "technology" to mean the method used to produce goods. Over the last 25 years, as the economic concept of goods has expanded to include intangibles such as education and health, the term technology has been broadened to cover how we educate or how we produce health. The difficulty of identifying and measuring technology and technological change arises because much of technology is of the soft variety, embedded in how we do things. Changes in it are subtle and difficult to identify.

Consider the simplest economic model of the price-taking, profit-maximizing firm, producing good q using capital inputs k and labor input l for sale at the market price p. Prices for these inputs, r and w, respectively, are also taken as given. In algebraic notation, the problem of the firm is to:

$$\max \text{PROFIT} = pq - (rk + wl)$$

$$\text{subject to} \quad q = f(k,l)$$

The technology of the firm is in essence captured in the production function or relationship $q = f(k,l)$. It is a relationship, and not necessarily a single item that one can point to. In this framework, product innovations can be thought of as new inputs (new types of k) that enter into the production function. In such cases, the technological change is said to be "embodied in capital." Process innovations would essentially produce shifts in the production function, resulting in the same output with fewer resources (and at a lower cost) or more output from a given set of inputs.

Determining whether two firms are using different technologies or whether technology has changed at a given firm is not as straightforward as it might seem at first. Since no two firms have identical employees and physical plant, identifying whether differences in output are due to technology versus other factors can be difficult. And, of course, due to phenomena such as learning by doing, even the "same" firm will not, even in theory, have the same technology over time.

As an empirical matter, how would we know if two firms are using different technologies? The answer is easiest if the firms differ in their set of inputs. For example, one uses a device that the other does not use. But what if they use the "same" inputs (as best as can be measured), face the same market output and input prices, choose the same levels of input use, but they produce different levels of output? In theory, this suggests that one is more efficient than the other. But empirically, measurement issues become important. Has an input (such as an advantageous location) been overlooked? Is some other output being produced that is not being considered? It can be difficult to distinguish empirically between inefficiency and these other factors. In the real world, most firms are multi-product firms and have some inputs that appear to be unique.

In addition, most outputs or goods can be seen as intermediate goods, in that they are inputs into more complex and less tangible goods. For example, medical treatment for hypertension can be seen as a good that is produced using inputs of physician visits and medication. This production technology would appear to vary across individual patients if physicians modify the therapy based on individual characteristics. Empirically separating these kinds of variations from actual differences in technology (i.e., different doctors using different treatment regimens in terms of the number of visits and

amount of medication for the same individual) would obviously be difficult.

Some of the empirical difficulties that could arise from these conceptual and measurement issues should be apparent, but they will become evident as the literature is reviewed below. There are also some other definitions and distinctions regarding medical technology used in the health services literature that are useful.

As shown in Figure 1, technological changes in health services are sometimes characterized in terms of whether they are (1) <u>cost-increasing</u> or <u>cost-decreasing</u> and (2) <u>quality-enhancing</u> or <u>quality-reducing</u>. Cost-increasing technologies are those that result in higher total costs for treatment of a given medical condition. Cost-decreasing technologies result in lower total costs. Quality-enhancing technological changes result in care that is more effective or more beneficial (in terms of outcomes) than the alternative. Quality-reducing care results in inferior outcomes.

As indicated in the figure, we would clearly want to adopt changes that decrease costs without lowering quality. However, the desirability of adopting a technological change is an open question for two types of changes: (1) cost-increasing and quality-enhancing and (2) cost-decreasing and quality-reducing. If costs rise, we will only want to adopt the change if the gain in quality (i.e., improvement in outcomes) is sufficiently large. Also, we may be willing to adopt some innovations that reduce quality (slightly) if costs fall sufficiently. In both of these later instances, the "cost-effectiveness" of the innovation is that issue, and the desirability of adoption depends on the cost-effectiveness of the technology. Clearly, much of the technological change in medical care falls into the category of cost-increasing, quality-enhancing changes where cost-effectiveness is an issue.

Figure 1

TECHNOLOGY IMPACTS ON COST AND QUALITY
AND THE ADOPTION DECISION

QUALITY IMPACT		COST IMPACT: Decrease	COST IMPACT: 0	COST IMPACT: Increase
	Decrease	?	Don't Adopt	Don't Adopt
	0	Adopt	Don't Adopt	Don't Adopt
	Increase	Adopt	Adopt	?

If the cost-effectiveness of various technologies can be measured on some common scale such as costs per "quality-adjusted life year gained", which has been done and yields plausible estimates for many kinds of technologies, then it is possible to use cost-effectiveness as a criterion in evaluating technological changes. A case can be made that technological changes that would increase aggregate Medicare payments to physicians should meet some minimum cost-effectiveness criterion.

In approaching the question of how changes in technology might affect Medicare physician services, the Physician Payment Review Commission (1990a; p. 172) has usefully distinguished among three types of changes:

1) Changes in the amount of physician work to produce a service;

2) Changes in the amount of nonphysician inputs used to produce the service; and

3) Changes in the number or composition of services used to treat a given condition or changes in the number of patients for whom the treatment would be appropriate.

Under the new Medicare fee schedule, the former two should result in changes in relative values, and hence fees. This in turn will affect aggregate expenditures. The two types of changes encompassed in the third category would also affect aggregate expenditures, but would not affect relative values.

Under the third category, a distinction can be made between new cases, where changes in technology lead to treatment of patient conditions that would not have used physician services previously, and substitution cases, where the change in technology for a given condition produces some change in the amount or mix of physician services used. Changes in technology involving substitution could be cost-increasing or cost-decreasing on a per case basis, or even vary for different kinds

of conditions. And some technological changes can reduce costs of physician services for some patients, while expanding the number of patients being treated by physicians. Hence, the impact on aggregate costs would be the sum of those changes involving (1) cost-increasing substitution cases, (2) cost-decreasing substitution cases, and (3) new cases (which by definition are cost-increasing).

It is not difficult to imagine technological changes that would simultaneously affect physician and nonphysician work involved in a procedure, the number of procedures needed to treat a given condition, and the number of patients for whom the new technology is appropriate. Each of these pathways of change would have impacts on aggregate expenditures.

3. MEASURING TECHNOLOGICAL CHANGE

A search for and review of published articles and other unpublished materials in the economics and health services literatures was conducted to identify possible approaches to measuring the impact of technological change on expenditures. Each of these literatures is discussed in turn.

3.1 Economics Literature

The economics literature of the past five years, as reflected in the Journal of Economic Literature and the Working Paper Series of the National Bureau of Economic Research, was searched for citations dealing with the effects of technological change on expenditures in a given market. Fewer than five articles of specific relevance were found.

Economists have traditionally studied technological change in the context of aggregate growth models, research and development expenditures and patents, agricultural production functions, economic development, industrial organization, sector-specific issues, and input-output analysis. Over 125 articles per year are still written in economics journals on these topics. The majority of the work appears in industrial organization journals, where the primary focus has been on determining the effects of firm characteristics and market structure on innovation and its diffusion. In the same vein, there has been some work involving the diffusion of new surgical techniques.

Input-output analysts have been studying technological change for over four decades. They define technological change as any change in the technical production coefficients over time. While this does allow measurement of the impact of the direct and indirect effects of technological change on expenditures, the input-output model is too aggregated and too old (1982 is latest

available model year for the U.S.) for use in the current context.

Before considering some of the complex methods used in the few articles in the literature, it may be useful to briefly review some fundamentals. First, recall the distinction made above between product innovations and process innovations. The former are new products heretofore unseen by man, e.g., the Salk vaccine for polio, or qualitative changes in existing products, e.g., a new (presumably more effective) Salk vaccine. Process innovations, on the other hand, are merely a more efficient way of producing a given product; thus, they involve a downward shift in the cost function. For example, laproscopic cholecystectomy should be less costly than surgery as a method for removing gallstones.

The issue of measuring the effect of technological change on expenditures is relatively simple, in theory, when dealing with a process innovation. Given an empirical estimate of the demand curve for the product, we can measure the downward shift in the marginal cost curve (assuming a perfectly competitive market) and compute the value of the cost savings to the consumer. The lower cost per unit results in greater use and perhaps greater expenditures, depending on the price elasticity of demand. If there is an increase in expenditures, it can be observed.

Product innovations, on the other hand, are not as easily observable and measurable. Accordingly, only a few economists have attempted to measure their impact by quantifying the incremental value society places on them. This is done using modern measures of consumer surplus (compensating or equivalent variation) via the application of "money-metric" utility functions. In other words, a dollar value is placed on the utility of the innovation to individuals. How is this done?

Consider an individual consuming a given bundle of two goods ($\bar{x}_1$, $\bar{x}_2$) as shown in Figure 2. Assume good 2 is the numeraire (i.e., a "base" good with price equal to unity). One can ask: how much income would the consumer need at some set of prices (p_1, p_2) to be as well off as he/she is with consumption at ($\bar{x}_1$, $\bar{x}_2$)? The slope of the budget line is p_1/p_2, and the vertical intercept is income (m) divided by p_2, or $(m/1)=m$. An indifference curve that goes through ($\bar{x}_1$, $\bar{x}_2$) and is tangent to the budget line anchored at m on the vertical axis and with slope p_1/p_2 certainly keeps the consumer as well off at the tangency as at ($\bar{x}_1$, $\bar{x}_2$). So the amount of income required to alter the consumer's bundle is m. And m is the value of the utility represented by the indifference curve.

To understand how money-metric utility could be used in the context of a health care innovation, consider the case of a consumer maximizing his utility over two goods: the services from CT scanners and all other goods. As shown in Figure 3, suppose the price of CT scanner services falls so that their use increases from point A to point A'. The "equivalent variation" measure of consumer surplus measures how much the consumer is willing to pay to obtain the price subsidy at the original price ratio. To find this amount, a new line (call it ab) is drawn parallel to the new budget line but tangent to the original indifference curve. Clearly, the distance on the vertical axis between the original budget constraint and ab measures (in dollars) the amount the consumer is willing to pay for the additional services from the CT scanner.

The above methodology is the standard one used for process innovations. It has been applied to the eyeglass sector by Feldman and Begun (1985) and the forest products industry by Seldon (1987). Feldman and Begun measure the welfare costs of quality changes due to legislated restrictions on vision exams by optometrists. Seldon estimates a production function (including

Figure 2
MEASURING UTILITY IN DOLLARS

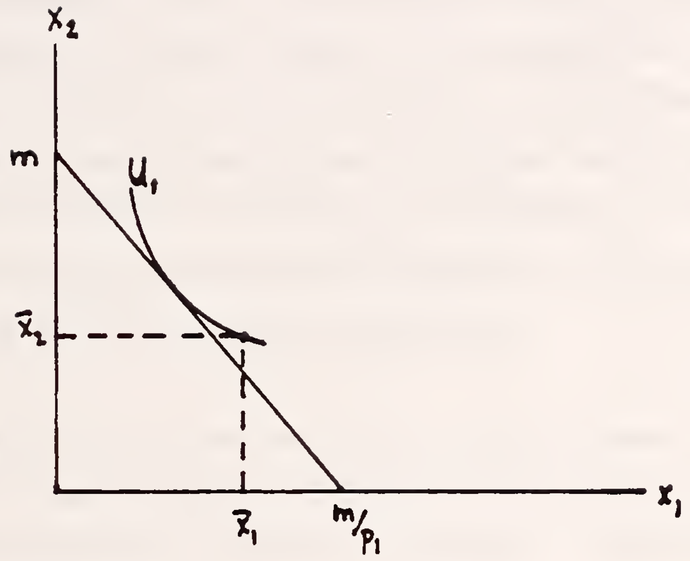
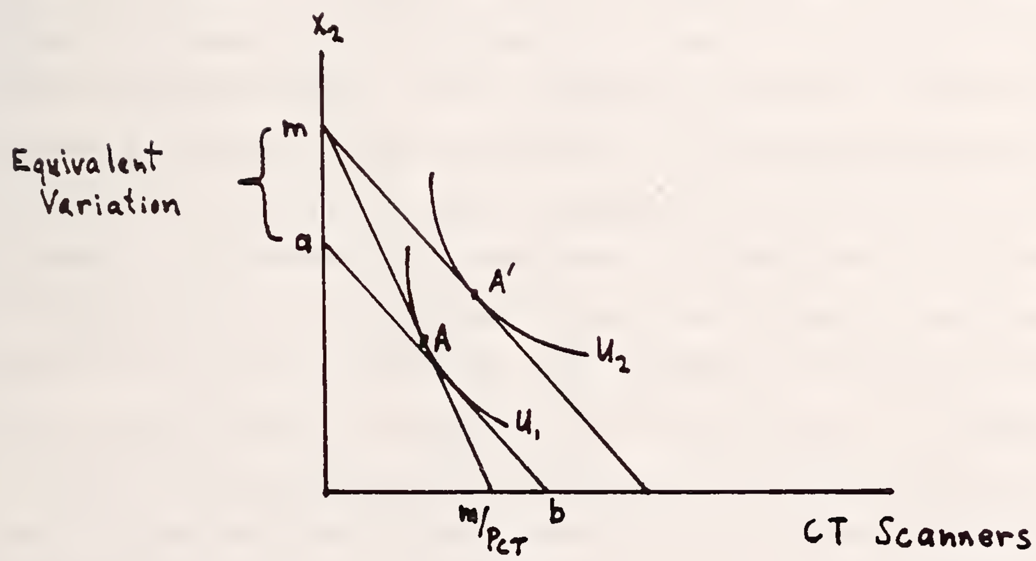


Figure 2
VALUING INNOVATION



an index of technological change) from which is derived a supply equation. In conjunction with estimates of a demand model, the changes in consumer and provider surplus are calculated.

Trajtenberg (1989, 1990) extends this methodology to the case of product innovations. Although we cannot observe the value that individuals previously would have placed on a new product, the characteristics of the new product can be observed. Using a Lancasterian analysis of demand, where goods are defined by a list of their characteristics, we are able to estimate the value people place on new products.

Mechanically, the method establishes values on the set of characteristics of the product in two periods, although in period 1 the new product is not available. The difference in the values measures what people are willing to pay for the new good. To go from valuing the innovation to a real price index which reflects the change in value of the set of characteristics, Trajtenberg uses the expenditure function as a measure of the value function.

While Trajtenberg's approach is ingenious, it has severe limitations in application to most medical care services. The most fundamental problem is that it assumes that market prices reflect the value that people place on medical services. This is questionable given the distortions induced by insurance and other aspects of medical care markets in the U.S. In more technical terms, asymmetrical information and moral hazard tend to lead consumers to suboptimal choices; thus, the implicit assumption of perfect information by all agents in Trajtenberg's methodology does not hold in medical care markets. A paper by Goddeeris (1984) illustrates this point in a theoretical model showing that with low patient coinsurance, it is possible to have increased expenditures on medical procedures even though welfare falls.

3.2 Health Services Literature

In recent years there has been a tremendous volume of work in the health services literature on medical technology assessment and the cost-effectiveness of alternative therapies. There have been some--but many fewer--analyses of the relationship between changes in the use of the technologies and medical expenditures. There is certainly a school of thought that identifies changes in medical technologies as the principal "culprit" behind our continuing cost increases (Schwartz, 1987). Several different kinds of evidence bear on this issue. Doessel (1986) reviews much of this evidence in a more general context, as do Garrison and Wojcik (1990), which the discussion below extends.

Since this hypothesis is really an assertion about a relationship between aggregates (total costs and all technological change), one approach attempts to analyze these two at an aggregate level, controlling for changes in other factors. Although costs can be measured at an aggregate level, there is no such measure of technology. As a result, a "residual" approach has been used, attempting to account for the growth in costs by measurable factors, such as price inflation and the growth in the aging population, and to attribute the unexplained residual to changes in technology. The limitations of this indirect method will be discussed below.

The principal alternative to this residual approach is to analyze changes in the use of specific technologies and therapies over time, and to attempt to aggregate their impact. Several studies described below provide evidence on particular technologies. At times, the difference between an aggregate approach and a technology-specific approach blurs. For example, some studies have taken a residual approach to examine the impact

of a particular technology, e.g., the provision of hospital care, since it is a large share of total health care costs.

Within each of these two major categories, there are some subgroups that can be classified as follows:

- o Residual approach
  - Aggregate analyses
  - Market models
  - Cross-sectional comparisons
- o Technology-specific approach
  - Cost-of-illness studies
  - Policy studies

Key findings from these studies follow.

Residual Approach

Aggregate Analyses

The claim that new medical technology is behind the continuing rise in health care costs is an assertion about the relationship between aggregates over time. Aggregate health or hospital expenditures are measurable; however, no direct measure exists of the aggregate amount of "technology" in the health care system at a point in time. While many individual new technologies and technological advances can be identified, accounting for the large number and variety of new "little-ticket" items and process innovations would be difficult to do.

Because of these measurement difficulties, analysts have used an indirect approach to testing this hypothesis. The approach is called a "residual approach" because technological change is calculated as the residual factor after changes due to other measurable factors have been accounted for statistically. Doessel (1986) provides a detailed review of these kinds of studies. Other measurable factors in these studies include such

factors as the size of the population, the changing age distribution of the population, changes in input prices or general inflation, changes in malpractice premiums, and changes in insurance coverage. The fact that most of these factors are measured imprecisely also creates problems for the statistical analysis. Consequently, the amount of change ascribed to technology in the residual may be in error. In addition, unexpected changes, such as the AIDS epidemic or alterations in peoples' beliefs about the effectiveness of health practices, may affect use and expenditures. The residual would also capture these types of changes since they may not be reflected in the other aggregate factors.

Several studies have used this residual approach to analyze both changes in aggregate health expenditures (or real per capita health expenditures) (Fuchs, 1972; Mushkin and Landefeld, 1979) and changes in hospital costs (Altman and Wallack, 1979; Schwartz, 1987). Aggregate hospital costs are often used as a proxy for the entire system because they represent 40 percent of total health care costs and because they are readily measurable.

Studying different but overlapping time periods, two major studies of total health expenditures by Fuchs (1972) and Mushkin and Landefeld (1979) came to opposite conclusions about the sign of the residual. Over the period 1930 to 1975, Mushkin and Landefeld estimated a small negative residual, suggesting that technology was cost-saving on average. Analyzing the shorter interval of 1947 to 1967, Fuchs estimated a positive, unexplained residual of 0.6 percent per annum, in part attributable to technology. Examining only hospital costs, Schwartz (1987) found an average annual residual of 3.5 percentage points that he attributes to technological change.

The residual approach has been applied by HCFA's Office of the Actuary to analyze changes in Medicare physician expenditures

during the 1980s. They found that about 45 percent of the growth over the past ten years was due to residual factors (Sullivan, 1989). Over a five-year period, they also estimated annual total percentage change in physician expenditures and the annual percentage left in the residual as follows:

	Change in Expenditures	
Year	Total	Residual
1982	16.6%	5.6%
1983	17.0%	9.6%
1984	19.4%	4.2%
1985	11.7%	2.5%
1986	10.9%	4.2%

This amount of variability in the residual raises obvious problems for assessing year-to-year changes vis-a-vis an average performance standard.

In general, several methodological problems limit the usefulness of the residual approach. The first major problem is the assumption that the residual reflects only technological change. A second major problem results from our inability to measure accurately other factors that affect expenditures such as changing insurance coverage or prices. Third, the residual approach makes the unwarranted assumption that technology is a totally exogenous factor determined outside the medical care system.

Market Models

Market econometric models of the health sector predict the level of utilization, and thus expenditures, as an interaction between separate demand and supply equations or functions. Usually, the demand for hospital care, for example, is seen as dependent on the price of that care, the health of the population of the market area, its income, and its insurance coverage. Usually, the supply of services in the area is modelled as dependent upon such factors as the number of beds available (in the short term), the number of doctors, and the price per day of

care. As in other markets, it is generally assumed that the price adjusts to equilibrate demand and supply. Economists attempt to estimate this kind of "structural" model using a combination of time series and cross-sectional data--across several market areas over a time period (see, for example, Feldstein, 1977; Davis, 1974).

Compared to the use of an aggregate national time series data, this approach has the advantage of a much greater number of observations across local market areas. Also, there is likely to be more variation in other variables, such as insurance coverage, yielding a better estimate of their impact.

Analyzing hospital costs, Feldstein (1977) finds that the increasing cost of care is related to quality of care, which in turn is related to technological change. He sees increasing insurance coverage as the major underlying factor, with technology playing a more passive, endogenous role. On the other hand, Davis (1974), also studying hospital costs, finds that 38 percent of the variability in hospital costs is not explained by demand and supply factors. How much of this residual is attributable to technology is unclear.

Again, the principal methodological limitation of these studies is the assumption that the unmeasured time trend is only due to technology and not to other changes in health practices, patterns of care, or other exogenous factors.

<u>Cross-Sectional Comparisons</u>

Two types of cross-sectional comparisons are sometimes made to support the argument that technological change plays a major role in rising costs. First, there are studies comparing countries. Compared to other countries, the U.S. clearly has both a much higher level of real per capita health care costs and a greater amount of high-cost technology (Rublee, 1989). This

evidence is certainly consistent with the hypothesis that greater use of new technologies is related to higher costs.

A second type of cross-sectional comparison analyzes differences across market areas in the relationship between the use of specific technologies and higher medical costs. Using data on over 5,000 hospitals, Robinson and Luft (1987), for example, found that, in 1982, average hospital costs per patient day were significantly higher in markets with more hospitals. In a related study of 1983 data on nearly 4,000 hospitals by Robinson, Garnick, and McPhee (1987), hospitals in these more competitive markets were much more likely to offer high-cost procedures such as coronary angioplasty and bypass surgery. However, many of these hospitals had low annual volumes for these procedures. Apparently, having to maintain the capacity to perform these high-cost procedures is a factor in why costs are higher for hospitals in more competitive markets. This suggests that hospitals are competing for patients and physicians on a "nonprice" basis by offering access to these sophisticated technologies.

Both of these kinds of cross-sectional evidence are consistent with the hypothesis that new technologies cause higher costs. But they are also consistent with alternative hypotheses. For example, comparing nations, Americans may simply have different preferences and higher incomes. Or, comparing local areas, our hospital reimbursement system may encourage nonprice competition by limiting price competition.

Technology-Specific Approaches

Cost-Of-Illness Studies

A particularly appealing approach to assessing the impact of changing medical technology on the costs of care is to analyze historical changes in how patients with particular conditions or

diseases are treated. This approach considers technologies at an identifiable, descriptive level rather than as an unmeasured residual. An obvious question with regard to measuring the aggregate impact of such changes arises concerning whether the set of illnesses chosen for analysis is a representative sample of all medical care treatment.

Scitovsky (1967, 1979, and 1985) studied changes in the cost of illness since 1951 for seven specific conditions, including appendicitis, myocardial infarction, and breast cancer, at the Palo Alto Medical Clinic in California. Through the year 1971, she had found that cost-increasing changes in treatment patterns had had a larger impact than cost-decreasing changes. As a result, average treatment costs rose substantially, largely due to the increased use of ancillary diagnostic services, such as lab tests and X-rays.

Interestingly, her more recent study, covering the period 1971 to 1981, yielded a different conclusion. Increases in the use of diagnostic tests slackened, but increases in the use of new high-cost technologies were the principal source of cost increases for treating these conditions. In particular, the big-ticket technologies had a large impact on the costs of treating myocardial infarction, breast cancer, and cesarean delivery.

Using a similar approach, Showstack et al. (1982) analyzed changes in the use of medical technologies for patients hospitalized for one of ten different diagnoses at a university hospital. Over the six-year period 1972-77, they found that the use of new diagnostic procedures--such as fetal monitoring and ultrasonography--increased significantly while the number of tests and procedures per hospital admission changed relatively little. In a later paper, Showstack et al. (1985) extended the study period for the ten diagnoses to 1982. They found, again,

that ". . . 'little ticket procedures', such as laboratory tests, did not contribute to rising costs, and newer imaging techniques were commonly substituted for older, more-invasive procedures." For the ten diagnoses studied, the primary cause of rising costs was not a particular test, device, or drug, but instead could be traced to broader changes, such as the increasing provision of surgery to patients with acute myocardial infarction and the more intensive treatment of critically ill newborns. Thus, neither little-ticket nor big-ticket, hardware technologies were the major source of cost increases. The cost impact was due more to process innovations such as surgery being applied to patients that had not previously received surgery. These are new cases, rather than substitution cases, in the terms defined above.

These cost-of-illness studies are instructive despite their limited generalizability due to the small number of diagnoses included and sites involved (only two facilities on the West Coast). They indicate, first, that the diffusion of new medical technologies is not a homogeneous or smooth process. Historically, at times, little-ticket items have had more influence while, at other times, big-ticket items have been important. And sometimes, process innovations are more important. All of this underscores the complexity of the process by which technologies develop and diffuse into medical care practice.

Policy Studies

In recent years, there have been several policy-related studies that attempt to understand the role that technological change has played in changing medical expenditures. Some are retrospective and some are prospective.

As cited in Kay (1990), analyses of data from four states by the Center for Health Economics Research (1988) found that changes in the use of 17 surgical procedures accounted for 50 percent of the increase in per-beneficiary expenditures on

surgery over 1983 to 1986. In fact, 25 percent of the increase was accounted for by changes in the use of cataract surgery. The other 50 percent was spread over the myriad of remaining procedures, with very low individual impacts on expenditures.

Over the past five years, Project HOPE (1987, 1988, 1989, 1990, and 1991) has conducted several studies for the Prospective Payment Assessment Commission, attempting to identify and estimate the cost impact of new and emerging technologies that are likely to significantly affect hospital inpatient operating costs for Medicare beneficiaries. The summary table projecting cost impacts for FY 1992 is shown as Table 1. The aggregate incremental impact on operating costs is estimated at $366 million for these highly visible new technologies. This is only 0.7 percent of the $50 billion that Medicare spends on hospital care annually. Also, on balance, this series of studies has found that the aggregate impact of cost-increasing technologies is greater than that for cost-decreasing technologies in recent years. However, this assessment was made only in terms of hospital operating costs, not considering capital, physician, or long-term costs. Furthermore, the additional costs generated in any one year in the aggregate were generally on the order of less than one percent of operating costs in the prior year.

PPRC (1990b) reports plans to consider a technology-specific approach for its MVPS recommendation similar to that used by ProPAC. For last year's report, after canvassing interested specialty groups and the literature, PPRC identified 29 new and diffusing technologies that might be affecting Medicare expenditures for physician services. (Fifteen of these were also on ProPAC's 1990 list of new hospital technologies.) As shown in Table 2, comparing changes in expenditure volume for selected carriers between 1986 and 1988, it was found that increases in the physician expenditures associated with these new technologies accounted for only about 11 percent of total expenditure growth. That is, the increased expenditures on these technologies

Table 1

ESTIMATED IMPACT OF COST-INCREASING TECHNOLOGIES ON "EXISTING" CASES IN PPS HOSPITALS FOR FY 1992

Technology	Incremental Increase in Medicare Inpatient Use (Existing Cases)		Estimates of Incremental Increase in Medicare Inpatient Operating Costs ($ Millions)		
	Low	High	Low	High	Best
Automatic Implantable Cardio-verter Defibrillators	2,600	4,100	65.0	127.1	96.0
--Lead Replacements	400	800	7.2	18.4	12.8
Monoclonal Antibodies	30,000	60,000	45.0	150.0	97.5
Thrombolytic Therapy	15,500	20,500	27.5	36.3	31.9
Low Osmolar & Nonionic Contrast Agents	70,000	364,000	5.3	37.1	21.2
Percutaneous Transluminal Coronary Angioplasty	15,600	21,600	20.6	28.5	20.6
Pacemakers (advances)	1,970	2,460	15.2	19.1	17.1
Electrophysiologic Studies	7,500	11,250	11.3	22.5	16.9
Single Photon Emission Computed Tomography	9,800	115,400	2.1	24.3	13.2
Magnetic Resonance Imaging	29,600	52,200	8.2	15.1	11.7
Positron Emission Tomography	5,200	14,560	5.8	16.2	11.0
Laser Angioplasty	2,250	4,340	3.7	6.8	5.3
Ultrasound (Advances)	12,000	21,600	2.4	4.3	3.4
Implantable Infusion Pumps	470	940	1.8	3.5	2.7
Percutaneous Transluminal Angioplasty	750	1,450	1.7	3.3	2.5
Customized Orthopedic Prosthetics	960	2,250	0.8	1.9	1.4
Atherectomy	870	1,140	0.5	0.7	0.6
			$224.1	$515.1	$365.8

SOURCE: Project HOPE (1991)

Table 2

Impact of New Technologies on Volume Growth, 1986 to 1988

Type of Procedure	1988 Charges ($Millions)	Annual Growth, 1986-1988		
		Charges	Price	Volume
All procedures	15,628	12.6	2.5	9.9
Excluding new technology	13,679	11.2	2.5	8.5
Nonsurgical Procedures	11,286	13.6	3.0	10.3
Excluding new technology	9,923	12.4	3.1	9.1
Surgical Procedures	4,341	10.1	1.4	8.6
Excluding new technology	3,756	8.0	1.1	6.8
New or diffusing technologies:				
ENDOSCOPY EXC LASER, TURP	530.8	15.2	2.7	12.1
CAT SCANS	329.7	20.2	4.6	14.9
LASER, OTHER	243.1	54.8	6.3	45.6
ULTRASOUND	202.4	10.4	-3.1	13.9
JOINT PROSTHESIS	152.1	15.4	0.8	14.5
DOPPLER	115.8	39.0	2.9	35.2
MRI	82.1	103.6	-4.5	113.2
PTCA	74.6	45.4	3.6	40.4
MAMMOGRAPHY	69.1	40.5	2.8	36.7
ARTHROSCOPY	39.1	28.0	4.5	22.5
EEG	16.0	7.8	4.0	3.7
ELECTROMYOGRAPHY	14.9	14.8	7.4	6.9
ESWL	14.0	37.1	4.5	31.2
RADIOISOTOPES	13.0	12.2	6.7	5.2
LASER ENDOSCOPY	12.7	49.8	6.1	41.2
ORGAN TRANSPLANT	10.9	2.2	4.5	-2.3
PVA, PTA	8.6	128.9	6.7	114.6
URODYNAMIC STUDIES	5.3	23.0	2.5	20.0
SPECT	3.9	-	-	-
PERCUTANEOUS DISKECTOMY	2.3	51.0	-2.2	54.4
IMPLANT INFUSION PUMP	2.2	35.2	-2.6	38.8
IMPLANT DEFBRIL	1.5	1169.4	-2.7	1204.3
MYOCARDIAL BIOPSY	1.3	30.4	-2.9	34.3
XRAY ABSORPIOMETRY	1.1	18.3	1.8	16.2
PULSE OXIMETRY	0.9	32.4	-5.4	40.0
THROMBOLYTIC THERAPY	0.5	244.9	-10.1	283.5
FLOW CYTOMETRY	0.4	457.7	7.2	420.3
BONE GROWTH STIMULATOR	0.1	47.1	-5.8	56.2
COCHLEAR IMPLANT	0.1	171.4	19.8	126.4

Source: PPRC analysis of 1986 and 1988 BMAD-1 data.

Note: Charge amounts are for a subset of Part B carriers judged to have consistent data over the period 1986-1988 representing roughly 54 percent of 1988 allowed charges.

Data are not on a per-enrollee basis.

The definitions of surgical and nonsurgical services approximately match the VPS definitions.

Source of table: PPRC(1990b)

represented only a 1.4 percent increase above the 1986 level, while total physician expenditures grew by 12.6 percent.

Recognizing that the PPRC study may have used a narrow definition of technology, Lee (1990) of the American Medical Association extends this analysis by broadening the definition of services to include complementary services related to the use of 13 of these technologies. The data used were Medicare data from 1985 to 1987. Complementary services were defined empirically in two alternative ways. For each of 13 principal procedures, the frequency of any other procedures used during the year was determined, and then sorted by frequency. Under the first definition, the most frequent five percent of codes were assumed to represent complementary services, tied to the use of the principal procedure. Thus, if the set of all patients with a principal procedure had 100 different additional procedure codes, the five codes with the highest frequencies were defined to be "related." Under the second definition, considering only those cases among those included under the first definition, those associated with 75 percent or more of principal procedures were considered as related codes.

Without accounting for any of the related procedures, changes in the use of the 13 technologies accounted for only 0.8 percent of the 12.8 percent change over this period. This finding is certainly consistent with PPRC's result. Under the broader definition of related or complementary services, these technologies and related codes accounted for 3.6 percent of the increase. Under the narrower definition of complementary services, they accounted for 1.5 percent.

All of these policy-related studies suggest the difficulties that technology-specific approaches have in accounting for the aggregate change in volume and intensity. They support the view that technological development and diffusion is a heterogenous

process yielding many technologies that are cost-increasing and many that are cost-decreasing. Furthermore, the impact in any one year can vary tremendously. For example, in the 1990 study for ProPAC (Project HOPE, 1990), it was estimated that if the use of automatic implantable defibrillators becomes as widespread as some experts predict, this one technology will have a significant impact on Medicare operating costs. Without this particular technology, the total impact on operating costs would be much less. Another interesting example is the change in technique, if not technology, associated with increased infection control in hospitals in response to AIDS. This was found to be a cost-increasing change in hospital practice. However, it would not have occurred without the AIDS epidemic. The residual approach to estimating the impact of technology on health care costs would also attribute this increase to a change in technology.

It should be noted that ProPAC's technology-specific approach, as carried out in the studies by Project HOPE, essentially begins each year anew, projecting the aggregate incremental impact on substitution cases, as defined above. No explicit consideration is given to whether past increases in the update factor have covered the costs of new technologies. A good case can be made that the impact of just a few individual new technologies can produce substantial variability in the year-to-year residual. Also, the cumulative impact of even an individual technology, such as the improvements in cataract surgery, can have a noticeable effect on aggregate costs (and the residual).

4. ALTERNATIVE APPROACHES

4.1 Key Findings from the Literature

The preceding review of the economics and health services literatures suggests several findings of relevance to the issue of measuring the impact of technological change on the volume and intensity of physician service use:

- The general economics literature does not provide a simple or straightforward method of identifying and measuring aggregate technological change and its impact on expenditures.
- Studies in the health services literature of the impact of changes in technology on costs follow one of two general methods--the residual approach or the technology-specific approach.
- Technological change takes a variety of forms, both hard and soft, that make it difficult to identify and measure.
- The net impact of technological change on physician expenditures appears to be cost-increasing. Some changes have been cost-decreasing, but in recent decades aggregate cost-increasing changes have exceeded aggregate cost-decreasing changes.
- Changes in technology can involve high cost per treatment or low cost per treatment and still have significant impacts on total expenditures.
- Identifiable new technologies tend to account for a relatively small proportion of the year-to-year increase in volume and intensity.
- As they diffuse over several years, single new technologies can have a substantial annual incremental cost impact.

DHHS (1990) reports an estimated average annual growth of 7.4 percent in Medicare physician expenditures between FY 1986 and FY 1990 above what would be explained by inflation, enrollment, and aging. In OBRA89, in defining a default MVPS, Congress established a long term policy goal of reducing this growth by 2 percentage points per annum. For FY 1991, HHS

proposed a reduction of 3.7 percentage points in this growth (DHHS, 1990). In making its MVPS recommendation, PPRC (1990b) contended that only a 2 percentage point reduction is feasible (though, due to a lower baseline, the net difference, compared to HHS, in their overall MVPS recommendation is only 1.3 percentage points).

These proposed standards can be viewed as policy goals. In constructing them, the first three factors mentioned in OBRA89--inflation, changes in the number of enrollees, and the aging of enrollees--are prima facie, justifiable sources of increases. They imply that, at the very least, beneficiaries should be able to receive the same volume and intensity of care that they received in the preceding year. In more technical terms, age-adjusted real per capita Medicare expenditures for physician services should, at least, remain constant. It is less clear how other factors should be taken into account.

These findings and the preceding discussion raise three questions about how the changes in technology can or should be considered in establishing Volume Performance Standards: (1) In principle, can changes in technology be separated from other factors that affect the growth in physician expenditures? (2) In practice, is it feasible to measure these changes, either prospectively or retrospectively? (3) Is the general approach represented by Performance Standards a desirable method of encouraging appropriate use of new technologies?

The answer to the first question is that, <u>in principle</u>, changes in technology can be distinguished from other factors that affect the growth in physician expenditures. Such changes can be quite complex, sometimes affecting physician work per encounter, other times affecting the number of encounters, and other times affecting the number of beneficiaries seen. Conceptually, there are technological changes, both cost-

increasing and cost-decreasing, that would be regarded as appropriate for coverage under the Medicare program. As suggested above, to be considered as appropriate such changes should presumably have to satisfy a cost-effectiveness criterion.

Despite the fact that a significant portion of technological change appears to be "soft", involving subtle changes in the use of existing inputs, it is still possible to conceptually distinguish such changes from other factors that affect the growth of Medicare physician expenditures, such as price changes, changes in the number of beneficiaries, and even changes in the amount of inappropriate care. On the other hand, it should be recognized that the amount of appropriate technological change is not a constant in the aggregate; conceptually, in any given year, it would be the summation of a myriad of cost-effective incremental changes. And it would vary as a proportion of expenditures from year to year.

Addressing the second question regarding the practical feasibility of measuring technological change, which has been the focus of this paper, is a more difficult issue. Certainly, no single method emerges from the literature summarized above as the best method for measuring technological change in physician expenditures. The literature does suggest three alternative approaches, not mutually exclusive, that could be useful: the residual approach, technology-specific approach, and an approach based on price indices. The pros and cons in terms of practical feasibility of each of these approaches are briefly discussed below.

4.2 Residual-Based Approaches

Residual-based approaches to incorporating changes in technology are best illustrated by the MVPS default formula. It uses the residual growth factor for the preceding five-year period as the baseline trend. Of course, the formula does not simply accept the current trend. Indeed, the statutory adjustment of a two percentage point reduction implies that continuation of current patterns of increase is no longer acceptable. It could be argued that the current method is a residual-based approach with a "policy adjustment."

Despite its reliance on trends in the residual, it should be apparent that this ad hoc adjustment is not really a residual-based approach to estimating an acceptable level of technological change that is cost-effective. Rather, the use of an ad hoc adjustment underscores the fact that this residual growth rate is more a measure of our ignorance than a measure of technological change. It represents technological change (both appropriate and inappropriate) only in the broadest sense, but cannot really distinguish between increases in demand from changes in technology and other factors. Thus, the current method could be seen more as an expression of the size of the increases that society might be willing to support on average, i.e., a policy goal or standard. Along these lines, one approach that might be considered would be to establish the standard by explicitly tying the acceptable growth to another measure such as the growth of real per capita income.

Even if there is no residual-based approach for forecasting the rate of <u>appropriate</u> technological change, the use of such an information ex post is also a possibility. For example, each Spring, DHHS will have aggregate information on how the growth in physician expenditures during the past fiscal year compares to the MVPS. For example, the HHS-recommended MVPS for FY 1990 of

9.1 percent could be compared to the estimated residual for FY 1990. Thus, it will be possible to monitor aggregate changes in the residual factor with a relatively short time lag. This would seem to be a plus for a residual approach, since the time lags in data availability would greatly limit our ability to analyze in detail--at the procedure level--the sources of any change in the preceding year will be more limited. However, as noted above, given the year-to-year variability in the estimated residual, it would seem to be extremely hazardous to base policy on this measure.

The statutory formula for the default MVPS essentially uses a five-year moving average to forecast the expected change in the coming fiscal year. Given the historical year-to-year variability in the size of this residual, this extrapolation will probably perform poorly in any given year. This has two important implications. First, in comparing the actual aggregate growth in any one year to the MVPS, we need to guard against the assumption that high rates of increase are necessarily the result of billing abuses or inappropriate care, rather than the justifiable diffusion of appropriate technologies. Second, at best, the performance standards established through the use of residual-based extrapolation should perhaps be considered as a broad or flexible policy goals rather than a forecast of what is desirable, or achievable in a given year.

The literatures reviewed here do not suggest any innovative methods for refining or modifying a residual-based approach in a way that would substantially improve the identification of the technology component from other factors. Market-based analyses (using structural demand and supply models) have some conceptual appeal, but would be quite costly and complicated to carry out on a continuing basis. Furthermore, it is not clear that they would provide much more useful information. They would no doubt demonstrate that technological change is highly variable across

time and markets. However, this approach would not allow any greater separation of the cumulative impact of the diffusion of identifiable, "hard" changes from more subtle, "soft" changes in the delivery system. Nor would it permit assessment of the desirability of these changes.

4.3 Technology-Specific Approaches

A technology-specific approach, such as that used last year by PPRC and for several years by ProPAC, tends to account for only a relatively minor share of total changes in expenditures. Some of the difficulties with this approach as a predictor of aggregate expenditure growth are obvious. First, different kinds of technological changes produce different kinds of impacts on total physician expenditures. For example, a new drug for treating hypertension could affect the number of patient encounters with cardiologists. Yet, with the existing Medicare data system, such a change could not be isolated since there are no claims for pharmaceuticals. Or new thrombolytic drugs like TPA or streptokinase administered to heart attack victims will save the lives of many beneficiaries, who will subsequently receive procedures, such as cardiac catheterization and coronary artery bypass surgery. Thus, much of the increase in costs will show up in these other, now old, technologies. In a sense, the combination of this new drug with these other procedures, some newer than others, is a new technology for treating heart attack victims. With current and foreseeable data systems, simply counting the number of times it is applied would be difficult.

New and improved diagnostic imaging technologies also represent a kind of technological change. CT scans and magnetic resonance imaging have been around for several years now, but their volume of use continues to increase due to incremental advances in their capabilities and extensions to new uses. The

procedure coding system is continually running to catch up to these advances. Data analysis necessarily lags behind this.

A distinction was drawn above between changes in technology involving new cases versus substitution cases. The former represent the extension of treatments to cases that were not previously receiving physician services for the condition, and latter represent cases where the treatment replaces another therapy involving physician services. Trying to isolate new cases from substitution cases is quite difficult without accurate information on the underlying medical conditions. Although physicians are now required under Medicare to report diagnosis for ambulatory services, our current ability to define episodes of care related to particular conditions is in its infancy. But such baseline information is needed to separate the impact of new therapies from existing ones.

In principle, Part B expenditures represent the application of the program benefit structure (in terms of the types of services covered) to prevailing clinical standards of necessary and appropriate care. Thus, if a new technology is covered under Part B, the Medicare program is committed to providing funds for it. The current methodology for the setting the MVPS makes adjustments for benefit changes. For example, for the recent expansion of coverage for pap smears, a forecast of the incremental aggregate cost impact was made and considered in making the MVPS recommendation.

Certainly, similar forecasts of the impact of the coverage of new technologies could be made and considered in the same way. The empirical difficulties are perhaps somewhat greater since the diffusion curve may be slower. The annual incremental impact of a new technology might grow over several years as it diffuses.

Currently, the Department is considering the use of cost-effectiveness as a criterion in the coverage process. Given some of the problems with cost-effectiveness measurement (e.g., that it varies across individuals and that our knowledge is often insufficient to allow precise estimates), it may be desirable to project the aggregate cost impacts of coverage decisions as part of this consideration. Such impacts could then be considered as part of the MVPS development process.

All of this is not to say that the diffusion of these technologies should not be monitored and attempts made to measure their impact. However, given the complexities of the diffusion process and interaction among various technologies, as yet, there is little reason to believe that these methods will yield reliable estimates of aggregate impact of new technologies versus other factors.

4.4 Index-Based Approaches

A number of enhancements to Medicare's data systems may make it possible to develop more reliable estimates of the volume and intensity of service. The implementation of the national Common Working File will greatly improve our ability to compute small-area, population-based use rates, especially for low volume procedures. And when procedural coding is made more uniform, so that carriers all use the same codes consistently, this will improve estimates of procedure volume. The nationally established relative work values for each of the service and procedure codes could be used as weights in an index to measure volume and intensity-adjusted workload over time and across geographic areas.

Of course, at the aggregate level, such an index is not greatly different from aggregate expenditures adjusted for price inflation. Thus, it would not yield much more information than

the residual approach. But it would be informative to analyze the components of change by broad categories of service and to identify services with large volume changes. These procedures are still a step removed from new technologies, which typically involve a combination of procedures. Furthermore, unless changes in demand or in inappropriate use can be separated from changes in technology, it will be difficult to use this approach to establishing acceptable levels of technological change.

It should be noted in passing that the approach of Trajtenberg (1989, 1990) represents another type of index approach. Despite its conceptual appeal, however, the data requirements for analyzing even a single technology are very substantial. In particular, it requires valid consumer valuations of products before and after the change. This presents a significant barrier for the analysis of medical treatments since the use of market prices as indicators of value is questionable for most services.

4.5 Encouraging Appropriate Use of New Technologies

The third question raised above was whether Performance Standards are a desirable method of encouraging appropriate use of technology while controlling aggregate costs. Rice and Bernstein (1990) have described well the limitations of national performance standards as a cost control measure. Clearly, it seems unlikely that the establishment of a national goal itself, with only the generalized threat of fee reductions if expenditures grow too quickly, provides much of an incentive for individual physicians to alter their behavior.

By the same token, it should be recognized that allowing some additional aggregate expenditure growth to provide for new technologies will do little to encourage the appropriate use of new technologies. There is no reason to assume that such a

generalized "pass-through" would lead to the diffusion of only the technologies that would meet a cost-effectiveness criterion.

5. CONCLUSION

This paper has reviewed the published literature as well as unpublished materials in an attempt to identify possible methods for measuring the impact of changes in technology on Medicare expenditures for physician services. In addition, an effort was made to consider how these methods might be used in addressing this component of the Medicare Volume Performance Standard.

No single method or combination of methods emerged as a suitable approach for dealing with this issue. In fact, it was argued that most of the methods would be unsatisfactory for this purpose. Although this conclusion is driven by data problems and limitations rather than conceptual difficulties, it is important to emphasize that these problems are most probably insurmountable.

Continuing improvements in HCFA data systems will no doubt greatly enhance our ability to analyze the impact of technological changes on various program dimensions, including costs. However, given the complexity of technological change, measuring appropriate change in the aggregate would be an overwhelming task. Again, this is not to say that the methods discussed here do not have utility for other purposes, nor is it meant to imply that efforts should not be made to study the diffusion and impact of new technologies.

Given the apparent substantial year-to-year variations in the estimated residual component of changes in Medicare physician expenditures, it is hard to see how this standard can provide more than a general guide. Aggregate expenditure growth could greatly exceed the standard in any one year through a confluence of desirable, appropriate changes in technology as well as other, unrelated factors. But since these causes cannot be separated,

there would not be a reliable basis for reducing the conversion factor or its growth as a response.

Indeed, there is a risk to the assumption that there should be a perpetual aggregate increase in physician expenditures due to technological change. Our reimbursement systems have had a bias toward the adoption of cost-increasing technological changes for many years with one result being continuing increases due to this source. Using an instrument as blunt as an aggregate pass-through would be inconsistent with the initiatives on outcomes and practice guidelines. These initiatives point to greater accountability in terms of cost-effectiveness at the individual level. An aggregate, undifferentiated pass-through for unevaluated technological changes works against such accountability.

As everyone is well aware, allowing more money in the aggregate for physician services does not mean that any particular technology will be provided. Other policy initiatives and activities in the Department may better serve the objective of promoting the appropriate diffusion of new technologies. These include: the use of cost-effectiveness for coverage decisions, the process for refining the resource-based relative values over time, and attempts to control costs through utilization review and practice guidelines.

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